THURSDAY, NOVEMBER 10, 1904.

JUSTUS VON LIEBIG AND FRIEDRICH MOHR.

Monographieen aus der Geschichte der Chemie. Herausgegeben von Dr. Georg W. A. Kahlbaum. viii. Heft. Justus von Liebig und Friedrich Mohr in ihren Briefen von 1834–1870. Pp. viii+274. (Leipzig: Johann Ambrosius Barth, 1904.) Price 8 marks.

DR. KAHLBAUM continues to put those chemists who are interested in the personal history of their science under an obligation to him by reason of the care and assiduity which he devotes to the editing of the letters of the great leaders of chemical inquiry such as Berzelius, Liebig, Wöhler, and others, as these from time to time come into his keeping. The volume before us deals with the correspondence of Liebig and Friedrich Mohr.

Of Liebig it is unnecessary at this date to say anything. His name and personal characteristics are well known to all who are interested in science, and his position in the history of science is assured for all time. Whilst his correspondence with Mohr adds but little to our knowledge of him as a man, it throws many sidelights on incidents which occurred during the most interesting and active periods of his career. Thus, for example, we learn for the first time of the relative share of Liebig and Wöhler in the work which resulted in the classical memoir on bitter almond oil. Most of the experimental work was due to Wöhler; the interpretation of the facts and the compilation of the memoir was made by Liebig. It would appear, in fact, that Wöhler never saw the memoir until the proof of it was sent to him.

Indeed, the chief interest of the correspondence, so far as it relates to Liebig, is concerned with his work as editor of the famous periodical—the *Annalen der Chemie und Pharmacie*—which is now permanently associated with his name.

The name of Friedrich Mohr is much less familiar, at all events to the chemists of this generation; and yet the author of the "Titrier-methode"—the practical founder of the art of volumetric analysis—deserves to be had in remembrance. He was a representative of a type of man of which few examples, at least in this country, are left to-day, viz. that of the scientific apothecary. He was by instinct, training, and practice a man of science, and he brought his knowledge, experience, and aptitudes as a man of science to the exercise of his calling. In this respect he resembled many of those who laid the foundations of modern chemical science. In the early part of the last century the occupation of the apothecary was practically the only one open to the man who had his living to make, and who at the same time wished to exercise his passion for chemical inquiry. Teaching appointments were few, and even where chemistry was taught the opportunities for experimental work were very meagre.

Mohr was born in Coblenz at about the time that Dalton gave the New Philosophy to the world. His father, Karl Mohr, apothecary, town councillor and member of the Rhenish Medical College, was a person of some importance in the city, and it was probably in his house that the authors of this correspondence first made each other's acquaintance.

Coblenz, from its proximity to the French frontier, was the scene of many stirring episodes during the early years of the nineteenth century, and Mohr himself lived through the time of, and was personally witness to, the rise and collapse of French military power during the interval between Moscow and Sedan. As a little boy he might have seen the passage of the Rhine by the French troops on the occasion of Napoleon's invasion of Russia, and have spelled out the magniloquent inscription on the fountain before St. Castor which commemorates that event, as well as the caustic words which St. Priest, the Russian commander following on the heels of the retreating French, caused to be added:—"*Vu et approuvé par nous, Commandant Russe de la Ville de Coblence: Janvier 1er 1814.*" As an old man he saw, after the *debâcle* of Sedan, the spectacle of a ruined and discredited War Minister skulking about in the twilight under the shade of the chestnuts in the Poppelsdorfer Allée in Bonn in just fear of the taunts and insults of the unfortunate soldiery whom he had betrayed.

In 1829 Mohr went to Heidelberg, where he came in contact with Leopold Gmelin. He had already acquired a considerable knowledge of operative chemistry and of pharmacology under his father's tuition. In those far-off days the laboratory of an apothecary was a reality, and those who practised the calling were not merely chemists by prescription, but were such in fact. They were for the most part well skilled in chemical processes, and actually made the greater number of the substances in which they dealt. The influence of this early training is to be seen in the character and scope of Mohr's subsequent work. He was essentially a *practical* chemist, and his services to the science consisted mainly in the improvements he effected in operative chemistry. Many of these humble but useful inventions were not calculated to bring their author much fame, but if his connection with them is well-nigh forgotten they at least secured for him the gratitude of his contemporaries. How many of the present generation of workers, it may be asked, associate his name with that commonest of laboratory appliances—the cork-borer?

Mohr remained at Heidelberg two years, and then repaired to Berlin to listen to Heinrich Rose's lectures. In 1832 he returned to Heidelberg and took his degree —*summa cum laude*. What a *summa cum laude* meant in 1832, so far as regards chemistry, may be inferred from the fact that the "hoch berühmten Führer," Gmelin, recorded that "the Herr Kandidat answered his questions on the chemical relations of iodine, the preparation of potassium iodide, the discovery of arsenic and on the preparation and composition of ether to his complete satisfaction." Creuzer found that he displayed considerable knowledge of what the old Greeks and Romans knew of botany and *materia medica*, and that he had a competent acquaintance with their languages; Muncke was satisfied with his answers concerning the balance,

the pyrometer, and the electrical relations of bodies; Leonhard with those on mineralogy and geology; and Schweins recorded that the "Kandidat als Pharmazeut ungewöhnliche Kenntnisse in der Mathematik besitzt" —whatever that might imply.

The subjects in which Mohr took his degree continued to interest him to the end of his days. In chemistry he was no theorist; indeed, the speculative side of this science seemed to have little or no attractions for him; and this is the more remarkable when it is remembered that in other departments of human thought he let his imagination have the fullest play, as may be seen in his "History of the Earth." Further, Mohr has some claim to be regarded as an independent discoverer of the law of the conservation of energy, as his tombstone in the old "Friedhof" in Bonn testifies.

To the historian of chemistry these letters have a special interest. If, as has been said, they add little to our knowledge of Liebig as a man and as a leader in science, they nevertheless afford much valuable information concerning matters which agitated the chemical world during some of the most stirring periods of the last century. They have been most carefully annotated by the editor and his assistants, as the numerous foot-notes indicate. Many passages and allusions which might have been obscure have been elucidated by their patient research. We can heartily commend the book to all who are interested in the personal and biographical history of chemistry.

T. E. T.

THE BIONOMICS OF EXOTIC FLOWERS.

Handbuch der Blütenbiologie. Begründet von Dr. Paul Knuth. iii. Band. Die bisher in aussereuropäischen Gebieten gemachten blüten-biologischen Beobachtungen unter Mitwirkung von Dr. Otto Appel. Bearbeitet und herausgegeben von Dr. Ernst Loew. i. Theil. Cycadaceæ bis Cornaceæ. Pp. 570; mit 141 Abbildungen im Text. (Leipzig: Engelmann, 1904.) Price 17s. net.

THIS valuable summary of available information concerning the pollination of exotic flowers maintains the high standard of the preceding volumes, though it naturally deals with knowledge essentially fragmentary and only rarely founded on a statistical basis. The work does not limit itself to imparting information upon actual observations on pollination, but in some cases includes accounts of the forms and colours of flowers, the arrangement of their nectaries, and even the microscopical details of fertilisation. As examples of the various matters dealt with, the following may be cited:—Freycinetia and its suggested pollination by bats, the remarkable synchronous blossoming habits of *Dendrobium crumenatum*, parthenogenesis in Ficus, Kooders's work on tropical geocarpous plants, the fertilisation of Rhopalocnemis, the peculiar flowers of the commelinaceous Cochliostema and their morphology, species of Yucca and their relations with Pronuba.

Among the many interesting features of the work we may note that in bringing together in one work the scattered observations on ornithophilous pollination it renders possible a survey of existing knowledge concerning the inter-relations of birds and flowers. Yet the facts recorded show the rudimentary stage of our knowledge as to the significance of birds in the shaping of flowers. Scattered through the present work we find evidence of actual or possible ornithophilous flowers belonging to a considerable number of natural orders, including the Bromeliaceæ, Liliaceæ (Alöe), Scitamineæ, Orchidaceæ, Proteaceæ, Loranthaceæ, Ranunculaceæ (Aquilegia), Capparidaceæ, Rosaceæ (almond, peach, quince), Caricaceæ, Leguminosæ, Melianthaceæ, Balsaminaceæ (Impatiens), Malvaceæ, Cactaceæ, Rhizophoraceæ, Myrtaceæ, Marcgraviaceæ, and Passifloraceæ. Included among these are flowers, such as the peach and almond, obviously not originally ornithophilous, and others, such as Passifloraceæ and *Aquilegia canadensis*, the pollination of which by birds is dubious. Still others there are, such as *Carica Papaya*, the structure and creamy tint of the flowers of which scarcely suggest ornithophily. Other observations show that in different parts of the earth the same species of flower is visited by different animals. For example, the entomophilous Japanese *Eriobotrya japonica* is visited by humming-birds in South America, and by honey-birds in South Africa. On the other hand, certain natural orders, such as the Loranthaceæ and Mimosaceæ, markedly show pollination, or at least regular visitation, by honey-birds in the Old World and by humming-birds in the New World; and some flowers of remarkable structure, such as those of *Amherstia nobilis* and *Hibiscus schizopetalus*, visited by birds seem to demand correspondingly remarkable methods of pollination.

The fragmentary nature of our knowledge in regard to pollination is shown by the lack of published information in regard to some of the commonest plants. For instance, *Bombax malabaricum* is not mentioned in this work, yet it is very widely distributed, and even common in some regions; and in southern China I know that its large red flowers are visited by small birds. In some cases the omission of information is due to oversight on the part of the authors; for example, there is no reference to the Vallisneria-like pollination of the submarine Enhalus. The work also shows that additional observations are required in regard to some of the commonest tropical plants. As a case in point, it may be said that few of those who have scented *Pandanus odoratissimus* at distances of a quarter of a mile will accept without further examination the view that littoral species of Pandanus are anemophilous. Or, again, Knuth found that the flowers *Cassytha filiformis* were mostly cleistogamous on the coral islands of the Java Sea; but unpublished observations of my own on Dane's Island, near Canton (China), sufficiently showed that this is not the case everywhere.

In regard to the printing of the work, it must be confessed that misprints are too numerous, a brief examination showing the following:—Kleistoam, Magroglossa, Abitulon, Spahtiphyllum, and Bromeliaceenhlüten.

PERCY GROOM.